5-2013

THE IMPACT OF RISING TRADE ON WAGE INEQUALITY: AN EMPIRICAL STUDY ON U.S.-CHINA TRADE FROM 2000-2010

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A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
Economics

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by
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May 2013

Accepted by:
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ABSTRACT

International trade has been cited as a source of widening wage inequality in industrial nations. In this paper, I investigate how the structure of the wage premium has been impacted within the United States due to rising trade with China. Using the U.S. Census data, since China joined WTO, I find the presence of the skill premium and over time the skill premium is higher. A counterfactual exercise indicates rising U.S. exports to China increase the wages of workers, especially for high-skilled laborers, and the effect is more pronounced in 2010. At the same time, increasing imports from China increase wages of high-skilled workers in the U.S., but push wages down for low-skilled workers. I also find strong evidence that less trade costs dramatically increase individual's wage rates; and the more education he/she has, the more wage growth he/she can benefit from decreasing trade costs. Rising trade balances actually promote wages for unskilled workers and decrease wages for skilled workers and its impacts on wages are falling and become relatively modest in the year 2010. In the end, I conclude that overall speaking, rising trade with China and less trade costs widen wage inequality in U.S.

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CHAPTER ONE

INTRODUCTION

While trade liberalization typically increases a country's real GDP, the distributional effects of trade have always been highly debated. These debates have intensified since China's accession into the World Trade Organization (WTO) and the expiration of the Multi-Fiber Agreement. The rise of trade, the increase in offshoring, and the growth of vertical specialization have no doubt had an impact on the industrial structure of the US economy. These factors have also impacted national and local labor markets. There have been several studies that have investigated the impact of trade on wages; some of these studies also examined the welfare implication in terms of calculating the costs and benefits of international trade. Robert C. Feenstra (2003) noted in this book, *Advanced International Trade*, that:

> The idea that countries gain from trade is as old as the idea of comparative advantage itself—Ricardo wrote his model of trade between England and Portugal to demonstrate both claims. But gains "for a country" does not have a well-defined meaning unless we specify what this condition implies for the many different individuals located there (p.204).

From the time of Ricardo, economists have argued that more open markets increase the welfare of the average citizen. However, these gains are often not shared equally throughout society. Within a country, trade liberalization can benefit some parts of the population while other portions of the population lose. One way to measure the impact of trade is to investigate how the growth in trade has impacted the wages paid to workers with differing skill levels across occupations. In this paper, I am going to discuss

how rising trade between the U.S. and China affects wage inequality of the U.S. labor markets, since China joined WTO at the end of 2001.

CHAPTER TWO

LITERATURE REVIEW

The wage premium, which can be defined as the ratio of the wages paid to high-skilled workers relative to wages paid to low-skilled workers (Marquis, Trehan, and Tantivong, 2011), has dramatically changed since 1980 (Autor, Katz, and Kearney, 2008). The decreasing demand for less-skilled labor and increasing demand for skilled labor directly generates a bigger wage gap between these two groups. Several authors (Card and DiNardo, 2002, Wheeler, 2005, Steelman and Weinberg, 2005) have argued that the growth in the skill premium (wage inequality) can be mostly attributed to skill-biased technical progress. In many of these studies, globalization is found to have contributed to the rising skill premium; but most find that it is of second order importance. Sampson (2011) points out that the demand for skilled workers and the increase in wage inequality increased in all countries, not only in the aggregate, but also "within the upper tail of the skill distribution"; and with endogenous technological progress, the rising demand for skill caused by globalization results from "technology upgrading by new exporters". Steelman and Weinberg (2005) concludes that wage inequality in United States was large during the first part of the twentieth century, decreased during the middle part of the century, and accelerated again toward the end of the century (Figure 2.1). Basco and Mestieri (2011) distinguish between (i) trade liberalizations in the 1980s, which increased trade in low-skill-intensive goods (denoted L-Globalization) and (ii) reductions in communication costs due to the IT revolution, which raised trade in middle-skill-intensive goods during the 1990s (denoted C-

Globalization), and they found wage inequality increases in both globalizations. Some studies conducted during the 1990s concluded that the effects of North-South trade on inequality were modest (Krugman, 2008). Katz and Murphy (1992) find that trade-induced changes in relative demand move in same direction that would be consistent with a widening wage premium; however, they find the magnitude of the effects could not plausibly account for much of the growth. However, it turns out that developing-country imports have roughly doubled as a share of the economy since the studies that concluded that the effects of trade on income inequality were modest. Krugman (2008) suggestes that we should scale up the estimates accordingly. By using employer-employee data of German manufacturing, Klein, Moser and Urban (2010) find a significant export wage premium for high-skilled workers and an export wage discount for lower skilled workers, and the export wage premium to high-skilled workers represents up to one third of their overall skill premium. Bivens (2007) claims that the distributional effects of trade are now much larger and by 2006, trade flows between the U.S. and its poorer trading partners increased relative earnings inequality by just under 7% relative to a no-trade baseline. Also, he predicted "over the next 10-20 years, if some prominent forecast of the reach service-sector offshoring holds true, and, if current patterns of trade roughly characterize this offshoring, then globalization could increase relative wages by 25% over this time". Artuc and Mclaren (2012) find that a worker's industry of employment is much more important than either the worker's occupation or skill class in determining whether he or she is harmed by a trade shock.

U.S. trade deficit with China has increased from $83 billion at 2000 to $295.5 billion at 2011[1](Table 2.1), while exports to China have grown, they have not kept pace with imports growth. Table 2.2 and Table 2.3[2] list the top ten U.S. imports from China and exports to China. In fact, China's exports to the U.S. have exceeded Chinese GDP growth. What can account for this phenomenon? Krugman (2008) suggests that the U.S. imports from China have risen much more rapidly than the growth of the Chinese economy, and this "excess growth" reflects reduced barriers to trade, which has led to greater international specialization and hence greater trade. According to Krugman's theory, the rapid growth in U.S.-China trade might reflect declines in the cost of international communication and shipping and the tariffs into the Chinese markets. In Robert Feenstra's (2007) book, *International Trade*, he quoted an example:

> Growth in automotive production and sales has been particularly strong since 2000, when China joined the World Trade Organization (WTO). With its accession to the WTO, China agreed to reduce its tariffs on autos, which were as high as 80% for passenger cars, down to 25% by July 2006. China has loosened its import quota as well; those tariffs and quotas, in addition to restrictions at the province and city level on what type of cars could be sold, had limited China's import and put a damper on the auto industry in that country. Prices were high and foreign producers were reluctant to sell their newest models. That situation has changed dramatically…as foreign firms scramble to compete in China with their latest designs and are even planning to export cars from China (p.314).

How have the U.S. labor markets responded to rising trade with China? How did U.S. skill premiums change due to decreasing trade barriers (trade costs)?

[1] Source: U.S.-China Business Council; U.S. Department of Commerce; U.S. International Trade Commission (ITC)
[2] Source: U.S.-China Business Council; U.S. Department of Commerce; U.S. International Trade Commission (ITC)

CHAPTER THREE

MODEL AND DATA

The model shows many of the features based on McLaren and Hakobyan's (2010) research on labor market effects of NAFTA. I use a 4.8% sample from the American Community Survey (ACS) of U.S. Census Bureau for 2001 and 2011, collected from usa.ipums.org, selecting employed workers from age 25 to 64 who report a positive pre-tax income in the previous calendar year. The sample size is 206,460 workers. Since China became a member of WTO at the end of 2001, I assume it was a watershed year in the U.S.-China trade history, and thus there was a structural change in wage allocation in the U.S. through this decade. Several features in my model need to be highlighted here.

As is standard in Mincer wage regressions, I include and control for individual characteristics, such as age, gender, martial status, whether or not able to speak English, race, and educational attainment (high school dropouts, high school graduates, people with some college education, college graduates and people with graduate degree).

Moreover, I "control for a worker's industry of employment" (McLaren and Hakobyan, 2010) and control for working location to allow for industrial and geographic divergence. In this paper, I will focus more on how trade between the U.S. and China affects industrial wage rates of workers with different educational attainments. I apply the North American Industry Classification System (NAICS) 3-digit sector and 27 industries are included (Table 3.1, Table 3.2). I apply place of work by state defined as the respondent's primary workplace and 50 states and the District of Columbia included in my sample. Moreover, I control for the individual's occupation, classified by the

American Community Survey occupational classification system and include 794 occupations in my sample.

Third, I calculate trade volumes, trade growth rates and import trade costs, instead of tariffs, as trade indicators to measure decreasing trade barriers. The increasing openness is not only expressed by decreasing tariffs, but also some trade agreements, policy supports, quotas and subsides, etc. Tariffs could be used but most of the decline in tariffs occurred before 2001, that is, the substantial decline of tariffs happened not after China became a member of WTO but the first decade from 1992-2003 (Figure 3.1).[3] China's reforms and Opening-up Policy raised by President Xiaoping Deng, and China's endeavors to apply for a position in WTO contribute a lot in driving Chinese tariffs down dramatically at that time. After that, since 2001, Chinese tariffs have declined gently and gradually. Taking into account all the facts above, I suggest trade volume is a better indicator than the tariffs here. I apply the NAICS 3-digit industrial U.S.-China import and export data from U.S. International Trade Statistics of U.S. Census Bureau, collected from censtats.census.gov. It supplies the information of annual U.S. industrial Chinese exports and imports (Table 3.3). Trade (import) cost is defined as:

$$\text{C. I. F. import value} - \text{customs import value}$$

I also use the import costs share of customs import value as an indicator of measuring trade costs share, which is defined as:

$$(\text{C. I. F. import value} - \text{customs import value})/\text{customs import value}$$

Trade growth rate at year t is defined as:

[3] Source: World Development Indicators, World Bank

$$(trade_t - trade_{t-1})/trade_{t-1}$$

and I apply each industry's export (import) data into this formula to get industrial annual export (import) growth rates.

Wage rates and trade volumes are all converted to constant 1999 US dollars. Table 3.2 presents the descriptive statistics for the main control variables. The sample is 29% female and 83% white, 71% married, with an average age of 44 years. 94% of the people are able to speak English. High school dropouts are 11% of the total, and high school graduates are 41% of the total. People with some college education share 24% of the whole population and 17% for the college graduates and 7% for people with graduate degree. In this paper, I define unskilled-labor, as the groups of high school dropouts, high school graduates and people with some college education, and I define the rest of them as skilled labor. Import trade costs share of import value varies from 2% to 27% among different industries, with an average of 7%.

My main regression equation is:

$$\begin{aligned}\log(w_i) = \alpha X_i &+ \sum_j \alpha_j^{ind}\, ind_{i,j} + \sum_s \alpha_s^{state}\, STATE_{i,s} + \sum_o \alpha_o^{occupation}\, OCC_{i,o} \\ &+ \alpha_0 yr2010_i + \alpha_{t1} trade_{i,j} + \alpha_{t2} trade_{i,j} yr2010_i \\ &+ \sum_k \beta_{1k} educ_{ik} + \sum_k \beta_{2k} educ_{ik} yr2010_i \\ &+ \sum_k \beta_{1k} educ_{ik} trade_{i,j} + \sum_k \beta_{2k} educ_{ik} trade_{i,j} yr2010_i + \epsilon_i\end{aligned}$$

where X_i is a set of individual characteristics; $ind_{i,j}$ is a dummy variable that equals to 1 if individual i is employed in industry j; $STATE_{i,s}$ is a dummy variable that takes a value of 1 if individual i's primary workplace is at state s; $OCC_{i,o}$ is a dummy variable that

equals 1 if individual i is employed as occupation o; $yr2010_i$ is a dummy variable that equals 1 if individual i is observed in the year 2010; $educ_{ik}$ is a dummy variable that takes a value of 1 if individual i is in the educational category k; $trade_{i,j}$ is trade indicators that represent U.S.-China annual industrial importing, exporting, trade costs, trade balances, trade growth rates of each specific NAICS 3-digit industry. For robustness, I measure those trade indicators using several different ways. In particular, by using the logarithmic forms and their percentage indexes, as well as different combinations of these functional forms applying one or several trade indicators at the same time, and all of them reveal different results that I will explain in the next chapter.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Overall Interpretation Regression

Table 4.1 shows the results for the specification without investigating the impact of trade; in this specification I control for individual characteristics, industry and the geographic fixed effects; and individuals who have some college education are the control group. Column (1) shows the results when I do not include the occupational fixed effects, while column two includes the occupational fixed effect. Married white men who speak English enjoy higher wages compared to others; the wage rate is a concave in age; the workers earn more when they have a higher education level, *ceteris paribus*. In 2010, skill premiums decrease for all workers except people with graduate degree and the wage ratio between skilled workers and unskilled workers is increased in the year 2010. In column (2), I control for occupational fixed effects; the results are qualitatively similar. Wage differences between male and female, married and single, different races, whether speaking English or not dramatically change, including wage premium across people who have different education levels. People with higher educational attainment have higher wages. There is some evidence that this skill premium between unskilled workers (high school dropouts and high school graduates) and people with graduate degree widened from 2000-2010, but did not widen between unskilled workers and college graduates.

4.2 Regressions by Logarithmic Trade Indicators

4.2.1 Trade Volumes

Table 4.2 and Table 4.3 shows the main regressions with all right-hand-side variables by introducing U.S.-China trade indicators as their logarithmic forms. Table 4.2 lists the results when I include export and import volumes in the regression, and individuals who have some college education are the baseline group. Fixed effect of education is relatively more reasonable when only including export volumes in regression, that is, people receive more wage premiums when they have a higher educational level, and wages across all workers increase in the year 2010. When I include import volumes in the regression, the outcome that high school graduates would have higher wage premiums than college graduates seems implausible, and people with graduate degree receive less wage premiums even than high school dropouts and high school graduates when taking into account the occupational fixed effect, which also seems implausible.

In this specification, I investigate the trade effects on people with different education levels. On one side, increasing imports from China drags down wages for unskilled workers and even more in the year 2010; it promotes wages for skilled workers but promotes less in the year 2010 than 2000. On contrary, increasing exports to China encourage wages for workers across all education levels, especially for high-skilled labors, and even more when it comes to year 2010. When excluding occupational fixed effects, in 2000, 1% increase in industrial exports to China would increase wages by 0.015% for high school dropouts, 0.024% for high school graduates, 0.035% for people with some college education, 0.044% for college graduates and 0.057% for people with graduate degree. When including occupational fixed effects, in 2000, 1% increase in

industrial exports to China would increase wages by 0.011% for high school dropouts, 0.020% for high school graduates, 0.027% for people with some college education, 0.036% for college graduates and 0.047% for people with graduate degree. Overall speaking, both increasing exports and imports widen wage inequality of U.S.

4.2.2 Trade balances and trade costs

Table 4.3 shows the regression by trade costs and trade balances. Trade costs here are simply the logarithmic forms of differences between C.I.F. import values and customs import values. Industrial trade balances are the logarithmic forms of differences between export volumes and import volumes of each industry.

Regressions by the logarithmic forms of industrial trade balances are imprecisely measured. But they indicate that: (1) skill premium exists because individuals with higher educational attainment receive higher wages. (2) When I do not consider the occupational fixed effects, increasing U.S.-China trade balances encourage wages for unskilled laborers, but drive down wages for skilled workers. And in the year 2010, increasing trade balances helps middle-skilled workers (high school graduates, people with some college education, college graduates) earn more, but high school dropouts and people with graduate degree do not benefit from rising trade balances. (3) When I take the occupational fixed effects into account, in 2000, trade balances push up wage rates for all workers, except those with graduate degrees. And when it comes to year 2010, rising trade balances also decrease wages for high school graduates, which I could not explain why. Overall speaking, trade balance-induced wage inequality becomes modest in 2010.

Regressions by industrial trade costs indicate that (1) college graduates, they seem implausibly receive lower wages than high school graduates. And basically, individuals gain more wage premiums in the year 2010, apart from high school graduates when I take the occupational fixed effects into account. (2) Overall speaking, less trade costs encourage higher wage rates for unskilled workers and even more in the year 2010. But surprisingly, less trade costs do not promote wages of skilled workers at all, and actually decrease skilled workers' wage rates, which I cannot explain why. Although it becomes somewhat better in the year 2010, it still remains a positive relation between trade costs and wage rates for skilled workers, which I believe is quite unexpected. Is it really true or is there something wrong when I picked up the mathematical forms of independent variables?

4.3 Regressions by Percentage Trade Indicators

4.3.1 Trade volumes

Rather than looking at logarithmic forms of trade volumes, this time I convert them into their share of GDP, multiplied by 100. This specification is reported in Table 4.4 and I find better statistical significances and magnitudes of estimated coefficients from them. Comparing to Table 4.2, estimators in Table 4.4 on fixed effects of education levels are almost all statistically significant and logical that people receive higher wages when they have higher educational attainments. When I include the occupational fixed effects in the regression, workers across all education levels gain higher wages in the year 2010 than 2000. Rising imports from China decrease wage rates for unskilled workers and increase wages for skilled workers in the year 2000. Taking the occupational fixed

effects into account, in 2000, 0.01% increase in industrial imports (from China) share of GDP results in wages decrease by 0.61% for high school dropouts, 0.65% for high school graduates, 0.36% for people with some college education, and wages increase by 0.20% for college graduates and 0.32% for people with graduate degree; in 2010, 0.01% increase in industrial imports (from China) share of GDP results in wages decrease by 0.22% for high school dropouts, 0.16% for high school graduates, 0.07% for people with some college education, and wages increase by 0.03% for college graduates and 0.02% for people with graduate degree. In 2010, the "import-export" regression shows that rising imports from China no longer push down wages for unskilled workers, but the "import-only" regression still indicates that imports from China pushes down unskilled laborers' wages. But according to those numbers I listed above, the import's impacts on wages become modest both for skilled and unskilled workers in 2010. And thus, the wage gaps between skilled and unskilled laborers, which are resulted from increasing imports from China, are smaller in the year 2010.

Then I take a look at the "export-only" regression. It indicates that rising exports to China still dramatically boost wage rates for most of workers, especially skilled laborers. For example, when I exclude the occupational fixed effects, in 2000, 0.01% increase in industrial exports (to China) share of GDP results in wages increase by 0.54% for high school graduates, 2.06% for people with some college education, 3.02% for college graduates and 3.91% for people with graduate degree; in 2010, 0.01% increase in industrial exports (to China) share of GDP results in wages increase by 0.28% for high school dropouts, 0.33% for high school graduates, 1.06% for people with some college

education and 1.56% for people with graduate degree. Even when I compare the results from regression including occupational fixed effects, they also come out with this same conclusion that export's impacts of promoting wages, especially for high skilled workers, are less in 2010. And also, the wage gaps, resulted from industrial exports to China, are also smaller in the year 2010, which is consistent with "import-only" regression results.

4.3.2 Trade balances, trade growth rates and trade costs

Table 4.5 introduces the impacts from trade balances, trade costs and annual industrial trade growth rates. Industrial trade balances are their shares of GDP, multiplied by 100. Trade costs applied here are the import costs share of import values as I have defined in the previous section; the annual trade growth rate is also defined in the previous section. Individuals gain more wage premiums when they have higher educational attainments.

Rising trade balances promote wages for unskilled workers and decrease wages for skilled workers; but the impact, both on wages of skilled and unskilled workers, becomes modest in the year 2010. For example, taking occupational fixed effects into account, in 2000, 0.01% increase in industrial Chinese trade balance share of GDP would increase wages by 0.69% for high school graduates, 0.41% for people with some college education, and decrease wages by 0.22% for college graduates and 0.34% for people with graduate degree; however, in 2010, 0.01% increase in industrial Chinese trade balance share of GDP would increase wages by 0.16% for high school graduates, 0.08% for people with some college education, and decrease wages by 0.03% for college graduates and 0.01% for people with graduate degree.

In 2000, industrial export growth rates (exports to China) supported higher wages for people with some college education, college graduates and people with graduate degrees, but gently decrease wages for unskilled laborers. In 2010, industrial export growth rates raise everyone's wage rates except high school dropouts. The industrial import growth rates (imports from China) do not show any statistical significance across all groups, but the rates still indicate that rising Chinese import growth will knock down wage rates for unskilled laborers in the United States. Overall speaking, both export and import growth rates widen wage inequality in U.S.

Less trade costs push up individual's wage rates, and the more education he/she has, the more wage growth he/she can get from decreasing trade costs. Particularly in the year 2000, when excluding the occupational fixed effects, 1% decrease in trade costs share of trade values increase wage rates for high school graduates by 1.17%, 1.70% for people with some college education, 2.64% for college graduates, and 3.00% for people with graduate degrees; and these effects across all laborers increase in the year 2010. If I take the occupation into account, in the year 2000, 1% decrease in trade costs share of trade values increase wage rates for high school graduates by 0.68%, 0.94% for people with some college education, 2.02% for college graduates, and 2.52% for people with graduate degrees. Falling U.S.-China trade costs have such noticeable effects on increasing wage rates. I conclude it due to the following two reasons: (1) as trade costs decline and import prices fall, the U.S. domestic demand for Chinese goods goes up and domestic production falls. Parts of producer surplus transfer to consumer surplus and there is also extra consumer surplus gaining from lower prices. (2) In the aspect of the

U.S. producers, since the Chinese government lowers tariffs, the U.S. products in Chinese markets become cheaper and then the Chinese demand for U.S. goods increases. In this way, parts of the Chinese government tariff revenue turn into Chinese consumer surplus and also U.S. producer surplus. Plus the decreasing trade costs, like transportation costs and communication costs, decrease; those expenses turn into producer surplus as well. Thus, the aggregate social welfare increases. In conclusion, less trade costs provide wage premiums for everyone but also widen the wage inequality in U.S.

4.4 Occupational Fixed Effects

When I compare all the results including the occupational fixed effects and without the occupational fixed effects in section *4.2* and *4.3*, I find out that, (1) including occupation as one of the independent variables mostly disperses and lowers the influences from trade on wages in my equation; (2) at the same time, it also significantly strengthens the part which is the skill premium's diversifications across different occupations and changes over-time itself, not the part induced by trade.

4.5 Regressions Control for Over-time Fixed Effects

In case of neglecting fixed effects of industry, location and occupation changing in the year 2010, I run a "full-impact" regression:

$$\log(w_i) = \alpha X_i + \sum_{j1} \alpha_{j1}^{ind}\, ind_{i,j1} + \sum_{s1} \alpha_{s1}^{state}\, STATE_{i,s1} + \sum_{o1} \alpha_{o1}^{occupation}\, OCC_{i,o1}$$
$$+ \sum_{j2} \alpha_{j2}^{ind}\, ind_{i,j2} yr2010_i + \sum_{s2} \alpha_{s2}^{state}\, STATE_{i,s2} yr2010_i$$
$$+ \sum_{o2} \alpha_{o2}^{occupation}\, OCC_{i,o2} yr2010_i + \alpha_0 yr2010_i + \alpha_{t1} trade_{i,j}$$
$$+ \alpha_{t2} trade_{i,j} yr2010_i + \sum_{k} \beta_{1k} educ_{ik} + \sum_{k} \beta_{2k} educ_{ik} yr2010_i$$
$$+ \sum_{k} \beta_{1k} educ_{ik} trade_{i,j} + \sum_{k} \beta_{2k} educ_{ik} trade_{i,j} yr2010_i + \epsilon_i$$

By adding those interactive terms I try to reduce overestimating or underestimating trade effects on wage rates. Results are shown at Table 4.6 and Table 4.7. Some variables are omitted because of perfect collinearity when I bring year2010's cross-terms with industry, occupation and states into model. Comparing Table 4.6 with Table 4.2 and Table 4.3, the statistical significances are consistent with previous results, and some estimated coefficients, like $\ln(export)$, $\ln(import)$, $\ln(trade\ balance)$, $\ln(trade\ balance) * year2010$, $\ln(trade\ cost)$, become even more significant; however, the significances of estimated constants are insignificant except the constant in the regression by trade balances; the magnitudes of coefficients mostly barely change. Imports widen wage gaps between skilled and unskilled workers and the import-induced gaps are smaller in 2010; exports provide wage discount for unskilled workers and export-induced wage gaps are bigger in 2010; more trade balance reduces wage gap but its impact is modest in 2010. The relations between wage inequality and trade volumes and trade balances across different education levels are consistent with previous results.

Comparing Table 4.7 with Table 4.4 and Table 4.5, the statistical significances are consistent with previous results, but the significances of estimated constants and

estimator $year2010$ become insignificant. On average, the magnitudes of coefficients change little. The relations of trade volumes share, trade balances share, trade costs share and trade growth rates across different education levels also do not really change. Imports widen wage gaps between skilled and unskilled workers and the import-induced gaps are smaller in 2010; exports provide wage discount for unskilled workers and this wage gaps are also smaller in 2010; more trade balance reduces wage gaps but its impact is modest in 2010; less trade costs no longer provide wage premium for unskilled workers, and there is less wage premium for skilled workers comparing with previous results. In conclusion, adding cross terms here indeed reduce some impacts from trade on wage rates, but overall speaking, it does not change the basic relation between trade and wage inequality. Also, it disperses the fixed effects of year 2010 and constants into three aspects: industrial, geographical, and occupational.

CHAPTER FIVE

CONCLUSIONS AND IMPERFECTIONS

International trade has been cited as a source of widening wage inequality in industrial nations (Klein, Moser and Urban, 2010). In this paper, I investigate how the structure of the wage premium has been impacted within the United States due to rising trade with China. Using the U.S. Census data, since China joined WTO, I find the presence of the skill premium and over time the skill premium is higher. A counterfactual exercise indicates rising U.S. exports to China increase the wages of workers, especially for high-skilled laborers, and the effect is more pronounced in 2010. At the same time, increasing imports from China increase wages of high-skilled workers in the U.S., but push wages down for low-skilled workers. I also find strong evidence that less trade costs dramatically increase individual's wage rates; and the more education he/she has, the more wage growth he/she can benefit from decreasing trade costs. Rising trade balances actually promote wages for unskilled workers and decrease wages for skilled workers and its impacts on wages are falling and become relatively modest in the year 2010. A summary of all the results can be found in Table 4.8. In the end, I conclude that overall speaking, rising trade with China and less trade costs widen wage inequality in U.S.

There are some imperfections in my study. Some important factors could have affected wage rates but I did not take them into account in this paper: (1) the technology innovations and progress. Technology progress has irreplaceable and undeniable effects on industrial wage growth and wage premium, but I did not include any technology indicator in my model. At this extent, it is possible that the trade effects on wages are

somewhat biased and could possibly be overestimated. (2) I did not include the impacts from immigration in my model. (3) Leamar (1994) argued that "the only legitimate approach is to rely on price information, rather than on the trade volume, which is endogenous". But Krugman (2008) suggested that, "in the real world, prices are as endogenous as trade volumes, and given the current state of data, it is not likely to quantify the actual effect of rising trade on wages until I have a better understanding of the increasingly fine-grained nature of international specialization and trade". Other than actually quantifying the trade effects on labor markets, my study may be a reference focusing more on the relation between trade growth, trade costs, and wage growth with education premium.

Table 2.1: China's Trade with the United States, 2000-11 ($ billion)

	2000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
US exports	19.2	22.1	28.4	34.7	41.8	55.2	65.2	71.5	69.6	91.9	103.9
% change*	18.3	14.7	28.9	22.2	20.5	32	18.1	9.5	-2.6	32.1	13.1
US imports	102.3	125.2	152.4	196.7	243.5	287.8	321.5	337.8	296.4	364.9	399.3
% change*	2.2	22.4	21.7	29.1	23.8	18.2	11.7	5.1	-12.3	23.1	9.4
US balance	-83	-103.1	-124	-162	-201.6	-232.5	-256.3	-266.3	-226.8	-273.1	-295.5

*Notes: *Calculated by USCBC. US exports reported on a free-alongside-ship basis; imports on a general customs-value basis.*
Source: US Department of Commerce; US International Trade Commission (ITC).

Table 2.2: Top Ten US Exports to China, 2011 ($ billion)

Commodity Description	Volume	% Change Over 2010*
Power generation equipment	10.8	9.70%
Oil seeds and oleaginous fruits	10.7	-3.10%
Electrical machinery and equipment	7.2	-16.60%
Vehicles, excluding rail	6.4	55.60%
Aircraft and spacecraft	6.3	10.80%
Optics and medical equipment	5.2	8.30%
Plastics and articles thereof	5	7.20%
Pulp and paperboard	3.8	27.10%
Copper and articles thereof	3.7	32.70%
Organic chemicals	3.5	17.80%

*Notes: *Calculated by USCBC. US exports reported on a free-alongside-ship basis; imports on a general customs-value basis.*

Source: US Department of Commerce; US International Trade Commission (ITC)

Table 2.3: Top Ten US Imports from China, 2011 ($ billion)

Commodity description	Volume	% Change over 2010*
Electrical machinery and equipment	98.7	8.7
Power generation equipment	94.9	14.7
Toys, games, and sports equipment	22.6	-9.4
Furniture	20.5	2.7
Footwear and parts thereof	16.7	5.1
Apparel, knitted or crocheted	15.1	7.4
Apparel, not knitted or crocheted	15	1.8
Plastics and articles thereof	10.9	13
Iron, steel	8.6	18
Vehicles, excluding rail	8.1	17

*Notes: *Calculated by USCBC. US exports reported on a free-alongside-ship basis; imports on a general customs-value basis.*
Source: US Department of Commerce; US International Trade Commission (ITC)

Table 3.1： NAICS United States Industrial Chinese Trade Volume (2000)

NAICS	Description	2000		
		*Exports	*General Imports	*General Imports
		F.A.S.Value Basic	Customs Value Basis	C.I.F Value Basis
111	Agricultural Products	1,117,440	104,861	114,891
112	Livestock and Livestock Products	13,332	33,770	36,995
113	Forestry Products, Nesoi	23,324	49,460	53,012
114	Fish, Fresh, Chilled, or Frozen and Other Marine Products	152,908	513,609	548,743
211	Oil And Gas	15,447	389,268	417,658
212	Minerals and Ores	86,002	135,661	181,832
311	Food and Kindred Products	530,688	498,354	564,451
312	Beverages and Tobacco Products	4,008	15,310	18,479
313	Textiles and Fabrics	77,019	395,525	418,354
314	Textile Mill Products	12,315	1,696,737	1,821,780
315	Apparel and Accessories	7,621	8,040,426	8,444,984
316	Leather and Allied Products	87,862	11,033,250	11,750,644
321	Wood Products	73,989	796,864	934,425
322	Paper	551,491	598,224	670,551
323	Printed Matter and Related Products, Nesoi	59,527	654,522	709,223
324	Petroleum and Coal Products	45,172	205,000	224,311
325	Chemicals	2,230,528	1,545,568	1,670,835
326	Plastics and Rubber Products	166,128	2,438,960	2,728,654
327	Nonmetallic Mineral Products	167,254	2,269,883	2,620,772
331	Primary Metal Manufacturing	370,695	1,087,533	1,208,031
332	Fabricated Metal Products, Nesoi	279,667	3,384,402	3,707,626
333	Machinery, Except Electrical	1,946,890	4,445,868	4,681,496
334	Computer and Electronic Products	4,089,234	23,859,726	24,828,153
335	Electrical Equipment, Appliances, and	406,887	8,307,235	9,028,868

	Component			
336	Transportation Equipment	1,957,184	2,139,651	2,337,549
337	Furniture and Fixtures	24,321	4,240,118	5,000,337
339	Miscellaneous Manufactured Commodities	150,056	16,378,666	17,818,223

*Note: *In Thousands of Dollars, converted to constant 1999 U.S. dollars*
Source: U.S. International Trade Statistics, United States Census Bureau

Table 3.2： NAICS United States Industrial Chinese Trade Volume (2010)

NAICS	Description	2010		
		*Exports	*General Imports	*General Imports
		F.A.S.Value Basic	Customs Value Basis	C.I.F Value Basis
111	Agricultural Products	10,522,627	357,310	376,709
112	Livestock and Livestock Products	159,526	28,383	29,857
113	Forestry Products, Nesoi	512,856	92,661	96,390
114	Fish, Fresh, Chilled, or Frozen and Other Marine Products	596,234	1,524,969	1,610,536
211	Oil And Gas	18,635	97,259	101,834
212	Minerals and Ores	1,571,726	143,400	179,438
311	Food and Kindred Products	2,171,619	2,180,379	2,389,762
312	Beverages and Tobacco Products	426,638	27,765	30,769
313	Textiles and Fabrics	311,988	1,057,229	1,135,441
314	Textile Mill Products	40,108	6,288,499	6,770,445
315	Apparel and Accessories	22,318	23,658,844	24,799,327
316	Leather and Allied Products	226,868	17,061,209	18,011,457
321	Wood Products	401,790	2,052,332	2,288,530
322	Paper	1,612,805	2,090,196	2,316,548
323	Printed Matter and Related Products, Nesoi	125,368	1,740,283	1,857,957
324	Petroleum and Coal Products	496,666	208,909	215,674
325	Chemicals	9,022,485	9,552,192	10,042,362
326	Plastics and Rubber Products	781,466	7,993,370	8,751,053
327	Nonmetallic Mineral Products	440,660	3,932,630	4,481,917
331	Primary Metal Manufacturing	2,364,478	2,728,500	2,893,213
332	Fabricated Metal Products, Nesoi	1,190,535	10,804,839	11,561,737
333	Machinery, Except Electrical	7,106,788	12,981,603	13,677,053
334	Computer and Electronic Products	11,652,175	101,436,352	103,504,086
335	Electrical	1,257,704	19,912,344	21,109,893

	Equipment, Appliances, and Component			
336	Transportation Equipment	8,110,613	6,776,847	7,246,338
337	Furniture and Fixtures	88,886	11,557,301	13,034,379
339	Miscellaneous Manufactured Commodities	1,162,195	28,654,087	30,159,902

*Note: *In Thousands of Dollars, converted to constant 1999 U.S. dollars*
Source: U.S. International Trade Statistics, United States Census Bureau

Table 3.3：Summary Statistics

Variable	Mean	St.Dev.	Min	Max
Age	44.77	10.24	25.00	64.00
Female	0.29	0.45	0.00	1.00
Married	0.71	0.45	0.00	1.00
Asian	0.05	0.22	0.00	1.00
Black or African American	0.07	0.26	0.00	1.00
White	0.83	0.37	0.00	1.00
English speaking	0.94	0.24	0.00	1.00
High school dropouts	0.11	0.31	0.00	1.00
High school graduates	0.41	0.49	0.00	1.00
Some college	0.24	0.43	0.00	1.00
College graduates	0.17	0.37	0.00	1.00
Graduate degree	0.07	0.26	0.00	1.00
ln(Annual export to China by industry)	14.11	1.76	8.41	16.20
ln(Annual import to China by industry)	15.15	1.85	10.10	18.50
Share of trade cost of import by industry	0.07	0.03	0.02	0.27
Export share of GDP (China) by industry *100	0.03	0.04	0.00	0.10
Import share of GDP (China) by industry *100	0.12	0.21	0.00	0.97
Annual export growth rate by industry	0.20	0.32	-0.47	3.29
Annual import growth rate by industry	0.10	0.15	-0.70	1.19

Table 4.1：Regression Results: Individual Characteristics

	Without occupation	With occupation
Age	0.0656***	0.0571***
	(0.00129)	(0.00123)
Age^2	-0.000643***	-0.000560***
	(0.0000146)	(0.0000139)
Female	-0.336***	-0.291***
	(0.00354)	(0.00382)
Married	0.145***	0.105***
	(0.00348)	(0.0033)
Asian	0.00635	0.0165
	(0.00965)	(0.00919)
Black or African American	-0.0600***	-0.0220*
	(0.00943)	(0.00907)
White	0.136***	0.0886***
	(0.00746)	(0.00716)
English speaking	0.319***	0.211***
	(0.00787)	(0.00773)
High school dropouts	-0.383***	-0.247***
	(0.00933)	(0.0096)
High school graduates	-0.183***	-0.0902***
	(0.00578)	(0.00577)
College graduates	0.372***	0.188***
	(0.00769)	(0.00797)
Graduate degree	0.603***	0.346***
	(0.0111)	(0.0118)
High school dropouts*(year=2010)	0.00974	0.0377**
	(0.0117)	(0.0122)
High school graduates*(year=2010)	-0.00394	0.0133
	(0.00751)	(0.0075)
College graduates*(year=2010)	0.0532***	0.0226*
	(0.00977)	(0.0102)
Graduate degree*(year=2010)	0.130***	0.0622***
	(0.0135)	(0.0146)
Year=2010	-0.105***	0.252***
	(0.00592)	(0.0163)
Constant	7.952***	7.474***
	(0.0687)	(0.0802)
Observations	206460	206460
R-squared	0.35	0.423

Standard errors are in parentheses.

** p<0.05, ** p<0.01, *** p<0.001*

Table 4.2: Regression Results: Logarithmic Trade Volumes

	lnEX lnIM		lnIM		lnEX	
	Without occupation	With occupation	Without occupation	With occupation	Without occupation	With occupation
High school dropouts	0.115	0.121	-0.0481	-0.00439	-0.129	-0.0528
	(-0.101)	(-0.103)	(0.0895)	(0.0914)	(0.0708)	(0.0703)
High school graduates	0.126	0.0946	0.0845	0.0618	-0.0429	-0.000275
	(0.0677)	(0.066)	(0.0642)	(0.0624)	(0.0471)	(0.0452)
College graduates	-0.0283	-0.191*	-0.0685	-0.217**	0.245***	0.065
	(0.0851)	(0.0784)	(0.0814)	(0.0754)	(0.0639)	(0.0583)
Graduate degree	0.119	-0.137	0.168	-0.0975	0.294**	0.0637
	(0.133)	(0.123)	(0.123)	(0.116)	(0.111)	(0.1)
High school dropouts	0.381**	0.342**	0.301**	0.209	0.116	0.202*
*(year=2010)	(0.129)	(0.131)	(0.107)	(0.111)	(0.0958)	(0.0951)
High school graduates	0.0761	0.064	0.0364	-0.00354	0.0815	0.105
*(year=2010)	(0.0886)	(0.0865)	(0.0795)	(0.0778)	(0.0689)	(0.066)
College graduates	0.00834	0.139	0.0943	0.17	-0.0947	0.0079
*(year=2010)	(0.111)	(0.103)	(0.0994)	(0.0932)	(0.0919)	(0.0852)
Graduate degree	0.103	0.107	0.176	0.133	0.0232	0.0312
*(year=2010)	(0.17)	(0.158)	(0.146)	(0.139)	(0.15)	(0.137)
Year=2010	-0.293***	0.0332	-0.0531	0.264***	-0.304***	0.0705
	(0.076)	(0.0775)	(0.0614)	(0.0614)	(0.0581)	(0.0593)
ln(export)	0.0156*	0.0261***			0.0348***	0.0267***
	(0.0075)	(0.00753)			(0.00553)	(0.00569)
ln(import)	-0.0280**	-0.0125	0.00162	-0.00214		
	(0.0102)	(0.0103)	(0.00804)	(0.00795)		
ln(export)*year2010	0.0157**	0.0106*			0.0101*	0.00933*
	(0.00485)	(0.00472)			(0.00395)	(0.00386)
ln(import)*year2010	-0.00197	0.00185	-0.00336	-0.0011		
	(0.0048)	(0.00465)	(0.00411)	(0.004)		
High school	-0.0218***	-0.0142*	-0.0235***	-0.0172**		
dropouts*import	(0.00647)	(0.00656)	(0.00617)	(0.00628)		
High school	-0.0166***	-0.00865	-0.0186***	-0.0107*		
graduates*import	(0.00481)	(0.00462)	(0.00437)	(0.00424)		
College degree*import	0.0346***	0.0307***	0.0300***	0.0278***		
	(0.00635)	(0.00588)	(0.00545)	(0.00504)		
Graduate degree*import	0.0237*	0.0249**	0.0291***	0.0300***		
	(0.0098)	(0.00938)	(0.00811)	(0.00764)		
High school dropouts*	-0.0164*	-0.00947	-0.0184*	-0.0105		
import*(year=2010)	(0.00762)	(0.00782)	(0.00725)	(0.00749)		
High school graduates*	-0.000405	0.00327	-0.00143	0.0018		
import*(year=2010)	(0.00584)	(0.00565)	(0.00528)	(0.00515)		
College degree*	-0.0113	-0.0143*	-0.00468	-0.0112		
import*(year=2010)	(0.00757)	(0.00708)	(0.00651)	(0.00609)		
Graduate degree*	-0.00535	-0.00454	-0.00513	-0.00664		
import*(year=2010)	(0.0113)	(0.0109)	(0.00941)	(0.00894)		

Table 4.2: Regression Results: Logarithmic Trade Volumes (continued)

High school	-0.0152**	-0.0134*			-0.0202***	-0.0155**
dropouts*export	(0.00576)	(0.00569)			(0.0055)	(0.00545)
High school	-0.00556	-0.00481			-0.0109**	-0.00701*
graduates*export	(0.0039)	(0.00371)			(0.00354)	(0.0034)
College degree*export	-0.008	-0.00513			0.00946*	0.00932*
	(0.00539)	(0.00496)			(0.00465)	(0.00425)
Graduate degree*export	0.00939	0.00829			0.0222**	0.0205**
	(0.00947)	(0.00872)			(0.00783)	(0.00707)
High school dropouts*	-0.00561	-0.00878			-0.00493	-0.00951
export*(year=2010)	(0.00739)	(0.00732)			(0.00706)	(0.00701)
High school graduates*	-0.00321	-0.00577			-0.00467	-0.00548
export*(year=2010)	(0.00545)	(0.00518)			(0.00491)	(0.0047)
College degree*	0.0131	0.00567			0.009	0.0000422
export*(year=2010)	(0.00743)	(0.00692)			(0.0064)	(0.00594)
Graduate degree*	0.00437	-0.000967			0.00489	0.000129
export*(year=2010)	(0.0123)	(0.0113)			(0.0102)	(0.00936)
Constant	8.839***	7.960***	8.182***	7.704***	7.544***	7.172***
	(0.159)	(0.162)	(0.141)	(0.142)	(0.0963)	(0.107)
R-squared	0.353	0.424	0.352	0.424	0.351	0.423

Standard errors are in parentheses.

** p<0.05, ** p<0.01, *** p<0.001*

Table 4.3: Regression Results: Logarithmic Trade Balances and Trade Costs

	ln(TradeBalance)		ln(TradeCost)	
	Without occupation	With occupation	Without occupation	With occupation
High school dropouts	-0.543**	-0.609**	-0.101	-0.0343
	(0.188)	(0.189)	(0.0824)	(0.0842)
High school graduates	-0.18	-0.189	0.0188	0.0224
	(0.136)	(0.134)	(0.062)	(0.0603)
College graduates	0.757***	0.347*	-0.0356	-0.157*
	(0.172)	(0.176)	(0.081)	(0.0748)
Graduate degree	1.084***	0.614**	0.206	-0.012
	(0.208)	(0.214)	(0.128)	(0.121)
High school dropouts	0.362	0.609**	0.213*	0.144
*(year=2010)	(0.193)	(0.194)	(0.0972)	(0.101)
High school graduates	0.147	0.234	0.0287	-0.011
*(year=2010)	(0.142)	(0.14)	(0.0755)	(0.0739)
College graduates*(year=2010)	-0.244	-0.0735	0.134	0.188*
	(0.181)	(0.184)	(0.0968)	(0.0906)
Graduate degree*(year=2010)	-0.128	-0.115	0.156	0.101
	(0.229)	(0.232)	(0.149)	(0.141)
Year=2010	-0.0919	0.433**	-0.0477	0.275***
	(0.119)	(0.132)	(0.0592)	(0.0593)
ln(trade balance)	0.0115	0.0187		
	(0.00965)	(0.0111)		
ln(trade balance)*year2010	-0.000999	-0.0116		
	(0.00903)	(0.00975)		
ln(trade balance)*	0.0094	0.0248		
high school dropouts	(0.0146)	(0.0147)		
ln(trade balance)*	-0.000298	0.00633		
high school graduates	(0.0104)	(0.0102)		
ln(trade balance)*	-0.0304*	-0.0115		
college graduates	(0.0131)	(0.0134)		
ln(trade balance)*	-0.0370*	-0.0195		
graduate degree	(0.0158)	(0.0163)		
ln(trade balance)*high school	-0.0206	-0.0396**		
dropouts*year2010	(0.015)	(0.0151)		
ln(trade balance)*high school	-0.0109	-0.0164		
graduates*year2010	(0.0108)	(0.0107)		
ln(trade balance)*college	0.0222	0.00546		
graduates*year2010	(0.0138)	(0.0141)		
ln(trade balance)*graduate	0.0174	0.00884		
degree*year2010	(0.0173)	(0.0175)		
lnCOST			-0.0142	-0.0125
			(0.00763)	(0.00753)
lnCOST*year2010			-0.00346	-0.00171

Table 4.3: Regression Results: Logarithmic Trade Balances and Trade Costs

(continued)

			(0.00478)	(0.00468)
lnCOST*high school dropouts			-0.0238***	-0.0182**
			(0.00683)	(0.00696)
lnCOST*high school graduates			-0.0170***	-0.00955
			(0.00509)	(0.00494)
lnCOST*college graduates			0.0337***	0.0287***
			(0.00658)	(0.00607)
lnCOST*graduate degree			0.0323**	0.0295**
			(0.0103)	(0.00967)
lnCOST*high school dropouts			-0.0161*	-0.00801
*year2010			(0.00796)	(0.00821)
lnCOST*high school graduates			-0.00173	0.00244
*year2010			(0.00608)	(0.00594)
lnCOST*college graduates			-0.0082	-0.0144*
*year2010			(0.00772)	(0.00722)
lnCOST*graduate degree			-0.00411	-0.00481
*year2010			(0.0117)	(0.0111)
Constant	8.752***	7.868***	8.387***	7.828***
	(0.151)	(0.185)	(0.117)	(0.119)
R-squared	0.364	0.429	0.352	0.423

Standard errors are in parentheses.

** p<0.05, ** p<0.01, *** p<0.001*

Table 4.4: Regression Results: Trade Volumes Share

	export% import%		import%		export%	
	Without occupation	With occupation	Without occupation	With occupation	Without occupation	With occupation
High school dropouts	-0.348***	-0.229***	-0.363***	-0.237***	-0.361***	-0.236
	(0.0123)	(0.0124)	(0.0115)	(0.0117)	(0.0117)	(0.0118)
High school graduates	-0.156***	-0.0751***	-0.162***	-0.0785***	-0.165***	-0.0816***
	(0.00803)	(0.0078)	(0.00725)	(0.00713)	(0.00785)	(0.00761)
College graduates	0.346***	0.156***	0.340***	0.151***	0.354***	0.165***
	(0.0114)	(0.0111)	(0.00992)	(0.0099)	(0.0114)	(0.0111)
Graduate degree	0.555***	0.286***	0.559***	0.293***	0.558***	0.292***
	(0.019)	(0.0183)	(0.0149)	(0.0152)	(0.019)	(0.0182)
High school dropouts	0.0182	0.0591***	0.0164	0.0424**	0.0149	0.0575***
*(year=2010)	(0.0161)	(0.0162)	(0.0141)	(0.0145)	(0.0155)	(0.0156)
High school graduates	0.00289	0.0242*	-0.00756	0.0114	0.00579	0.0273**
*(year=2010)	(0.011)	(0.0106)	(0.00921)	(0.00908)	(0.0108)	(0.0105)
College graduates	0.0424**	0.0294*	0.0628***	0.0399**	0.0399**	0.0242
*(year=2010)	(0.0154)	(0.0148)	(0.0123)	(0.0124)	(0.0153)	(0.0148)
Graduate degree	0.142***	0.0850***	0.160***	0.0936***	0.142***	0.0836***
*(year=2010)	(0.025)	(0.0239)	(0.0179)	(0.0185)	(0.0249)	(0.0239)
Year=2010	-0.132***	0.220***	-0.111***	0.247***	-0.121***	0.239***
	(0.00948)	(0.0181)	(0.0073)	(0.0168)	(0.00895)	(0.0176)
import*100/GDP	0.147	-0.0715	-0.0707	-0.358**		
	(0.16)	(0.156)	(0.129)	(0.123)		
(import*100/GDP)	0.118	0.228*	0.0865	0.287**		
*year2010	(0.118)	(0.114)	(0.104)	(0.0986)		
export*100/GDP	7.638***	6.235***			2.060***	1.416**
	(1.12)	(1.194)			(0.488)	(0.485)
(export*100/GDP)*	-5.264***	-4.280***			-0.999**	-0.671
year2010	(0.835)	(0.879)			(0.359)	(0.349)
High school dropouts*	-1.881*	-1.21			-2.372***	-1.279*
export share of GDP	(0.772)	(0.753)			(0.664)	(0.646)
High school graduates*	-0.903*	-0.48			-1.520***	-0.772*
export share of GDP	(0.44)	(0.418)			(0.366)	(0.345)
College degree*	-0.554	-0.355			0.962*	1.377***
export share of GDP	(0.573)	(0.533)			(0.423)	(0.388)
Graduate degree*	0.54	0.765			1.854**	2.460***
export share of GDP	(0.867)	(0.794)			(0.611)	(0.567)
High school dropouts*export share of GDP*(year=2010)	1.222	0.378			1.595*	0.414
	(0.796)	(0.779)			(0.692)	(0.674)
High school graduates*export share of GDP*(year=2010)	0.384	-0.0226			0.792*	0.182
	(0.463)	(0.44)			(0.389)	(0.368)
College degree*export share of GDP *(year=2010)	0.845	0.478			-0.356	-0.937*
	(0.6)	(0.559)			(0.452)	(0.417)

Table 4.4: Regression Results: Trade Volumes Share (continued)

Graduates degree*export share of GDP *(year=2010)	-0.184	-0.488			-1.356*	-1.895**
	(0.9)	(0.826)			(0.651)	(0.603)
High school dropouts*	-0.357*	-0.139	-0.513***	-0.256		
import share of GDP	(0.173)	(0.168)	(0.149)	(0.144)		
High school graduates*	-0.387***	-0.226*	-0.500***	-0.289***		
import share of GDP	(0.101)	(0.0959)	(0.0843)	(0.0792)		
College degree*	0.524***	0.595***	0.463***	0.554***		
import share of GDP	(0.122)	(0.114)	(0.09)	(0.0834)		
Graduate degree*	0.434**	0.550***	0.540***	0.676***		
import share of GDP	(0.167)	(0.157)	(0.118)	(0.112)		
High school dropouts*import share of GDP*(year=2010)	0.129	0.0261	0.248	0.104		
	(0.176)	(0.172)	(0.152)	(0.149)		
High school graduates*import share of GDP*(year=2010)	0.270**	0.166	0.354***	0.201*		
	(0.104)	(0.0982)	(0.0867)	(0.0815)		
College degree*import share of GDP *(year=2010)	-0.438***	-0.498***	-0.364***	-0.453***		
	(0.124)	(0.116)	(0.0923)	(0.0856)		
Graduates degree*import share of GDP *(year=2010)	-0.408*	-0.471**	-0.504***	-0.589***		
	(0.169)	(0.159)	(0.12)	(0.114)		
Constant	7.957***	7.524***	7.963***	7.505***	7.960***	7.510***
	(0.0687)	(0.0805)	(0.0686)	(0.0802)	(0.0687)	(0.0805)
R-squared	0.352	0.424	0.351	0.423	0.351	0.423

Standard errors are in parentheses.

** p<0.05, ** p<0.01, *** p<0.001*

Table 4.5: Regression Results: Trade Balance Share,

Trade Costs Share and Trade Growth Rate

	trade balance%		trade cost%		trade growth	
	Without occupation	With occupation	Without occupation	With occupation	Without occupation	With occupation
High school dropouts	-0.370***	-0.241***	-0.414***	-0.248***	-0.360***	-0.229***
	(0.011)	(0.0112)	(0.0228)	(0.0226)	(0.0105)	(0.0106)
High school graduates	-0.168***	-0.0821***	-0.234***	-0.116***	-0.170***	-0.0794***
	(0.00678)	(0.00671)	(0.0138)	(0.0133)	(0.0068)	(0.00666)
College graduates	0.344***	0.157***	0.451***	0.278***	0.358***	0.178***
	(0.00925)	(0.00934)	(0.0185)	(0.0174)	(0.00936)	(0.00931)
Graduate degree	0.568***	0.304***	0.707***	0.470***	0.611***	0.351***
	(0.0137)	(0.0142)	(0.0269)	(0.0255)	(0.0143)	(0.0145)
High school dropouts*(year=2010)	0.012	0.0386**	-0.0179	-0.00403	0.0507**	0.0688***
	(0.0133)	(0.0138)	(0.0287)	(0.0287)	(0.0186)	(0.019)
High school graduates*(year=2010)	-0.00793	0.0105	-0.00348	0.00413	-0.00581	0.00766
	(0.00863)	(0.00855)	(0.0178)	(0.0172)	(0.0129)	(0.0126)
College graduates*(year=2010)	0.0637***	0.0390***	0.0646**	0.0223	0.0505**	0.0422**
	(0.0115)	(0.0117)	(0.0232)	(0.0221)	(0.016)	(0.0156)
Graduate degree*(year=2010)	0.154***	0.0880***	0.0752*	0.0076	0.0862***	0.0485*
	(0.0165)	(0.0173)	(0.0324)	(0.0311)	(0.0217)	(0.0217)
Year=2010	-0.110***	0.247***	-0.103***	0.256***	-0.0922***	0.251***
	(0.00682)	(0.0166)	(0.014)	(0.0204)	(0.0114)	(0.0186)
(Trade balance)*100/GDP	0.166	0.413***				
	(0.123)	(0.117)				
((Trade balance)*100/GDP)*year2010	-0.16	-0.334***				
	(0.103)	(0.0978)				
Trade balance share*highschool dropouts	0.438**	0.197				
	(0.164)	(0.159)				
Trade balance share*high school graduates	0.489***	0.280**				
	(0.0943)	(0.0887)				
Trade balance share*college graduates	-0.543***	-0.637***				
	(0.103)	(0.0963)				
Trade balance share*graduate degree	-0.603***	-0.748***				
	(0.135)	(0.129)				
Trade balance share*highschool dropouts *year2010	-0.19	-0.075				
	(0.168)	(0.164)				
Trade balance share*high school graduates *year2010	-0.352***	-0.203*				
	(0.0967)	(0.0911)				
Trade balance share*college graduates *year2010	0.442***	0.531***				
	(0.106)	(0.0984)				
Trade balance share*graduate degree *year2010	0.566***	0.657***				
	(0.137)	(0.131)				
Trade cost share			-1.695***	-0.944***		

Table 4.5: Regression Results: Trade Balance Share,

Trade Costs Share and Trade Growth Rate (continued)

	(0.23)	(0.226)		
Tradecost*(year=2010)	-0.760***	-0.519**		
	(0.188)	(0.184)		
High school dropouts*trade cost	0.31	-0.0108		
	(0.22)	(0.215)		
High school graduates*trade cost	0.525***	0.262*		
	(0.139)	(0.133)		
College degree*trade cost	-0.947***	-1.076***		
	(0.21)	(0.193)		
Graduate degree*trade cost	-1.312***	-1.573***		
	(0.34)	(0.31)		
High school dropouts*trade cost*(year=2010)	0.538	0.635*		
	(0.327)	(0.322)		
High school graduates*trade cost*(year=2010)	0.234	0.266		
	(0.212)	(0.203)		
College degree*trade cost*(year=2010)	-0.668*	-0.483		
	(0.307)	(0.284)		
Graduate degree*trade cost*(year=2010)	0.33	0.282		
	(0.476)	(0.439)		
Export growth rate			0.0519***	0.0418**
			(0.0139)	(0.0129)
Export growth rate*year2010			-0.00726	0.0234
			(0.0286)	(0.0276)
Import growth rate			0.0305	-0.00198
			(0.0258)	(0.0256)
Import growth rate*year2010			-0.0827	-0.0111
			(0.0541)	(0.0529)
High school dropouts*export growth			-0.0726***	-0.0627***
			(0.0172)	(0.0164)
High school graduates*export growth			-0.0544***	-0.0470***
			(0.0153)	(0.0141)
College degree*export growth			0.0514*	0.039
			(0.0222)	(0.02)
Graduate degree*export growth			-0.0462	-0.0267
			(0.0383)	(0.0337)
High school dropouts*export growth *(year=2010)			-0.109*	-0.0969*
			(0.0452)	(0.0448)
High school graduates*export growth *(year=2010)			0.0256	0.0128
			(0.0309)	(0.0295)
College degree*export growth*(year=2010)			0.00674	-0.0269
			(0.0388)	(0.0362)
Graduate degree*export growth*(year=2010)			0.0882	0.00301

Table 4.5: Regression Results: Trade Balance Share,

Trade Costs Share and Trade Growth Rate (continued)

					(0.0541)	(0.0503)
High school dropouts*import growth					-0.0609	-0.0316
					(0.0527)	(0.0524)
High school graduates*import growth					0.0000574	0.0142
					(0.0304)	(0.0298)
College degree*import growth					0.0576	0.0364
					(0.0413)	(0.0378)
Graduate degree*import growth					0.0837	0.0139
					(0.0722)	(0.0641)
High school dropouts*import growth *(year=2010)					-0.199*	-0.14
					(0.092)	(0.0915)
High school graduates*import growth *(year=2010)					-0.0457	-0.00924
					(0.0573)	(0.0555)
College degree*import growth*(year=2010)					0.0028	-0.119
					(0.0702)	(0.0656)
Graduate degree*import growth*(year=2010)					0.118	0.0719
					(0.102)	(0.0944)
Constant	7.962***	7.498***	8.083***	7.506***	7.938***	7.452***
	(0.0686)	(0.0802)	(0.0711)	(0.0819)	(0.0689)	(0.0815)
R-squared	0.351	0.423	0.351	0.423	0.351	0.423

Standard errors are in parentheses.

** p<0.05, ** p<0.01, *** p<0.001*

Table 4.6: Regression Results: Full-impacts (1)

	lnEX lnIM	lnIM	lnEX	lnTradeBalance	lnTradeCost
High school dropouts	0.12	0.0143	-0.0598	-0.646***	-0.00987
	(0.103)	(0.0921)	(0.0709)	(0.189)	(0.0847)
High school graduates	0.0879	0.0611	-0.00459	-0.205	0.0254
	(0.0662)	(0.0626)	(0.0452)	(0.133)	(0.0604)
College graduates	-0.184*	-0.213**	0.0703	0.344	-0.154*
	(0.0782)	(0.0753)	(0.0581)	(0.177)	(0.0747)
Graduate degree	-0.131	-0.114	0.0971	0.625**	-0.0291
	(0.124)	(0.117)	(0.1)	(0.214)	(0.122)
High school dropouts*(year=2010)	0.361**	0.192	0.221*	0.650***	0.12
	(0.133)	(0.113)	(0.0972)	(0.195)	(0.102)
High school graduates*(year=2010)	0.0758	-0.00126	0.114	0.25	-0.0129
	(0.087)	(0.0784)	(0.0662)	(0.139)	(0.0743)
College graduates*(year=2010)	0.136	0.169	0.00431	-0.0717	0.187*
	(0.103)	(0.0933)	(0.0852)	(0.185)	(0.0905)
Graduate degree*(year=2010)	0.0948	0.152	-0.0157	-0.133	0.121
	(0.159)	(0.141)	(0.138)	(0.233)	(0.143)
ln(export)	0.0728***		-0.130***		
	(0.00641)		(0.0107)		
ln(import)	-0.0756***	-0.0272**			
	(0.00784)	(0.00931)			
ln(export)*year2010	0.0443		0.0291		
	(20.56)		(.)		
ln(import)*year2010	0.0709	0.0913			
	(28.39)	(54.01)			
High school dropouts*import	-0.0147*	-0.0182**			
	(0.0066)	(0.00633)			
High school graduates*import	-0.00843	-0.0105*			
	(0.00464)	(0.00426)			
College degree*import	0.0303***	0.0275***			
	(0.00588)	(0.00504)			
Graduate degree*import	0.0285**	0.0308***			
	(0.00944)	(0.00771)			
High school dropouts	-0.00933	-0.00968			
Import(year=2010)	(0.00791)	(0.00759)			
High school graduates	0.003	0.00153			
import(year=2010)	(0.00568)	(0.00519)			
College degree*import*(year=2010)	-0.0143*	-0.0113			
	(0.00709)	(0.00609)			
Graduate degree*import*(year=2010)	-0.00918	-0.00792			
	(0.011)	(0.00904)			
High school dropouts*export	-0.0122*		-0.0145**		
	(0.00573)		(0.0055)		
High school graduates*export	-0.00432		-0.00647		

Table 4.6: Regression Results: Full-impacts (1) (continued)

	(0.0037)	(0.0034)		
College degree*export	-0.00528	0.00894*		
	(0.00495)	(0.00424)		
Graduate degree*export	0.00356	0.0177*		
	(0.00873)	(0.00708)		
High school dropouts	-0.011	-0.0115		
export(year=2010)	(0.00746)	(0.00716)		
High school graduates	-0.00656	-0.00634		
export(year=2010)	(0.00518)	(0.00472)		
College degree*export*(year=2010)	0.00569	0.000122		
	(0.0069)	(0.00594)		
Graduate degree*export*(year=2010)	0.00499	0.00352		
	(0.0114)	(0.0094)		
ln((EX-IM)*CPI99)			0.0595***	
			(0.0111)	
ln(trade banlance)*year2010			-0.0915***	
			(0.0149)	
ln(trade balance)*high school dropouts			0.028	
			(0.0147)	
ln(trade balance)*high school graduates			0.00765	
			(0.0102)	
ln(trade balance)*college graduates			-0.0115	
			(0.0135)	
ln(trade balance)*graduate degree			-0.0216	
			(0.0163)	
ln(trade balance)*high school dropouts			-0.0433**	
*year2010			(0.0152)	
ln(trade balance)*high school graduates			-0.0177	
*year2010			(0.0106)	
ln(trade balance)*college graduates			0.00535	
*year2010			(0.0141)	
ln(trade balance)*graduate degree			0.0115	
*year2010			(0.0176)	
lnCOST				-0.0663***
				(0.015)
lnCOST*year2010				0.0662
				(.)
lnCOST*high school dropouts				-0.0199**
				(0.007)
lnCOST*high school graduates				-0.00964
				(0.00495)
lnCOST*college graduates				0.0285***
				(0.00607)
lnCOST*graduate degree				0.0305**

Table 4.6: Regression Results: Full-impacts (1) (continued)

					(0.00974)
lnCOST*high school dropouts*year2010					-0.00645
					(0.0083)
lnCOST*high school graduates*year2010					0.00245
					(0.00597)
lnCOST*college graduates*year2010					-0.0147*
					(0.00721)
lnCOST*graduate degree*year2010					-0.00652
					(0.0112)
Constant	8.37	8.536	11	8.671***	9.606
	(701.9)	(894.3)	(36.85)	(0.154)	(.)
R-squared	0.426	0.426	0.425	0.432	0.425

Standard errors are in parentheses.

** p<0.05, ** p<0.01, *** p<0.001*

Table 4.7: Regression Results: Full-impacts (2)

	emport% import%	import%	export%	trade balance%	trade cost%	trade growth
High school dropouts	-0.226***	-0.232***	-0.231***	-0.236***	-0.237***	-0.226***
	(0.0125)	(0.0118)	(0.0119)	(0.0113)	(0.0228)	(0.0107)
High school graduates	-0.0737***	-0.0764***	-0.0795***	-0.0798***	-0.112***	-0.0781***
	(0.0078)	(0.00714)	(0.00761)	(0.00672)	(0.0133)	(0.00667)
College graduates	0.156***	0.153***	0.165***	0.158***	0.277***	0.178***
	(0.0111)	(0.00991)	(0.0111)	(0.00935)	(0.0175)	(0.00932)
Graduate degree	0.284***	0.288***	0.287***	0.298***	0.464***	0.348***
	(0.0183)	(0.0153)	(0.0183)	(0.0143)	(0.0256)	(0.0146)
High school dropouts*(year=2010)	0.0541***	0.0344*	0.0524***	0.0308*	-0.0197	0.0656***
	(0.0164)	(0.0147)	(0.0158)	(0.014)	(0.0291)	(0.0193)
High school graduates*(year=2010)	0.0229*	0.00927	0.0253*	0.00814	-0.000634	0.00866
	(0.0107)	(0.00912)	(0.0105)	(0.00858)	(0.0174)	(0.0127)
College graduates*(year=2010)	0.0262	0.0353**	0.0219	0.0347**	0.0199	0.0396*
	(0.0148)	(0.0124)	(0.0148)	(0.0117)	(0.0222)	(0.0156)
Graduate degree*(year=2010)	0.0810***	0.0937***	0.0814***	0.0886***	0.0101	0.0459*
	(0.024)	(0.0186)	(0.024)	(0.0174)	(0.0315)	(0.0218)
Year=2010	0.324	0.324	0.324	0.322	0.337	0.271
	(57.59)	(.)	(.)	(82.68)	(73.57)	(.)
High school dropouts*	-1.069		-1.326*			
export share of GDP	(0.753)		(0.645)			
High school graduates*	-0.356		-0.796*			
export share of GDP	(0.417)		(0.345)			
College degree*export share of GDP	-0.42		1.412***			
	(0.531)		(0.388)			
Graduate degree*	0.302		2.472***			
export share of GDP	(0.796)		(0.569)			
High school dropouts* export share	0.248		0.424			
of GDP*(year=2010)	(0.782)		(0.676)			
High school graduates*export share	-0.15		0.212			
of GDP*(year=2010)	(0.44)		(0.368)			
College degree*export share	0.546		-0.988*			
of GDP*(year=2010)	(0.557)		(0.417)			
Graduates degree*export share	0.0174		-1.886**			
of GDP*(year=2010)	(0.828)		(0.606)			
High school dropouts*	-0.186	-0.290*				
import share of GDP	(0.168)	(0.145)				
High school graduates*	-0.247**	-0.290***				
import share of GDP	(0.0957)	(0.0792)				
College degree*import share of GDP	0.593***	0.536***				
	(0.114)	(0.0835)				
Graduate degree*	0.638***	0.683***				
import share of GDP	(0.157)	(0.113)				

Table 4.7: Regression Results: Full-impacts (2) (continued)

High school dropouts*import share of GDP*(year=2010)	0.0771	0.143				
	(0.173)	(0.149)				
High school graduates*import share of GDP*(year=2010)	0.189	0.203*				
	(0.0981)	(0.0815)				
College degree*import share of GDP*(year=2010)	-0.496***	-0.434***				
	(0.116)	(0.0857)				
Graduates degree*import share of GDP*(year=2010)	-0.561***	-0.595***				
	(0.159)	(0.115)				
Trade balance share* high school dropouts			0.248			
			(0.16)			
Trade balance share* high school graduates			0.290**			
			(0.0887)			
Trade balance share* college graduates			-0.617***			
			(0.0963)			
Trade balance share *graduate degree			-0.768***			
			(0.129)			
Trade balance share*highs school dropouts *year2010			-0.135			
			(0.164)			
Trade balance share*high school graduates*year2010			-0.215*			
			(0.091)			
Trade balance share*college graduates*year2010			0.511***			
			(0.0984)			
Trade balance share*graduate degree*year2010			0.678***			
			(0.131)			
High school dropouts*trade cost				-0.0745		
				(0.217)		
High school graduates*trade cost				0.24		
				(0.133)		
College degree*trade cost				-1.067***		
				(0.193)		
Graduate degree*trade cost				-1.583***		
				(0.312)		
High school dropouts*trade cost *(year=2010)				0.741*		
				(0.325)		
High school graduates*trade 43ost *(year=2010)				0.287		
				(0.205)		
College degree*trade cost *(year=2010)				-0.478		
				(0.285)		
Graduate degree*trade cost *(year=2010)				0.28		
				(0.444)		
High school dropouts*export growth					-0.0594***	
					(0.0166)	
High school graduates*export growth					-0.0435**	

Table 4.7: Regression Results: Full-impacts (2) (continued)

						(0.0141)
College degree*export growth						0.0391*
						(0.0199)
Graduate degree*export growth						-0.034
						(0.0335)
High school dropouts*export growth *(year=2010)						-0.0978*
						(0.0451)
High school graduates*export growth *(year=2010)						0.00746
						(0.0296)
College degree*export growth *(year=2010)						-0.0299
						(0.0362)
Graduate degree*export growth *(year=2010)						0.0118
						(0.0503)
High school dropouts*import growth						-0.0325
						(0.0522)
High school graduates						0.0106
*import growth						(0.0296)
College degree*import growth						0.038
						(0.0376)
Graduate degree*import growth						0.0338
						(0.0638)
High school dropouts*import growth *(year=2010)						-0.158
						(0.0916)
High school graduates*						-0.0188
import growth*(year=2010)						(0.0555)
College degree*import growth *(year=2010)						-0.123
						(0.0655)
Graduate degree*import growth *(year=2010)						0.0534
						(0.0943)
Constant	9.204	9.217	9.193	9.221	9.186	9.53
	(34.92)	(.)	(.)	(84.04)	(73.89)	(.)
R-squared	0.426	0.425	0.425	0.425	0.425	0.425

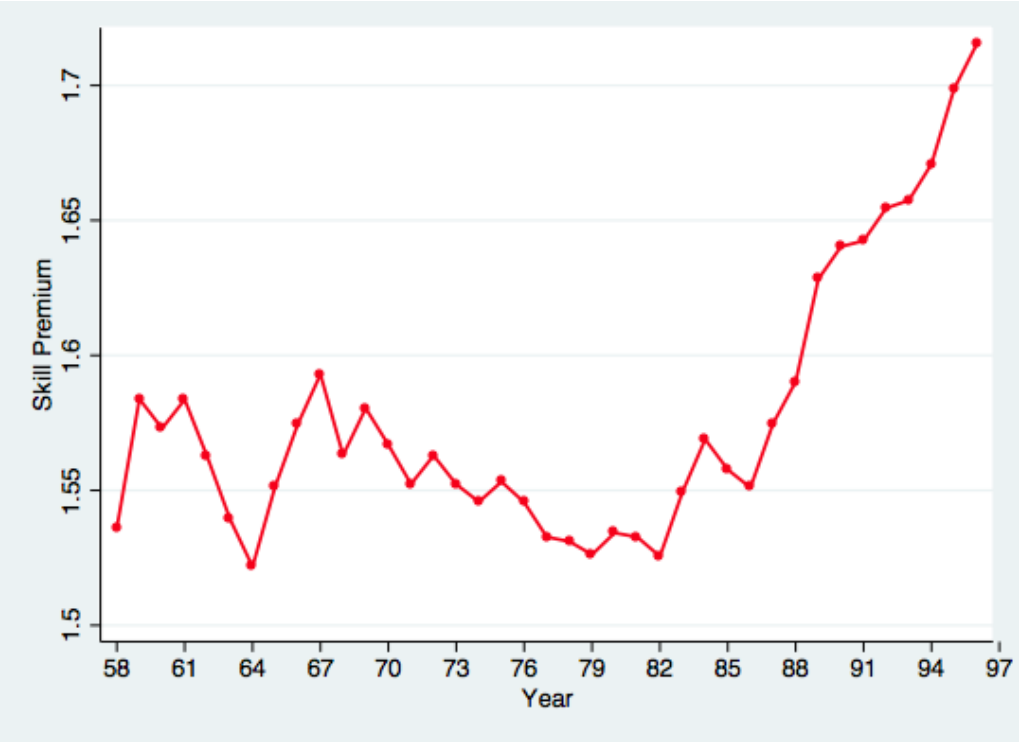
Standard errors are in parentheses.

** p<0.05, ** p<0.01, *** p<0.001*

Table 4.8 Results Summary

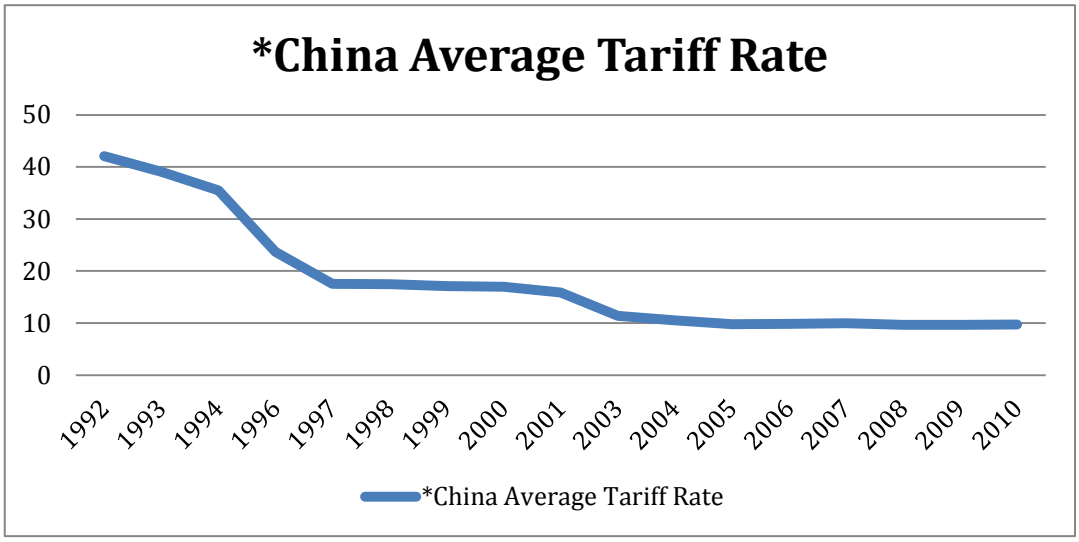
	ln(export)		ln(import)		ln(tradecost)		export*100/GDP		import*100/GDP		TradeCost%		TradeBalance*100 /GDP		ExportGrwoth%		ImportGrwoth%	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
High school dropouts	0.0112	0.0110	(0.0193)	(0.0309)	(0.0307)	(0.0404)	0.1370	(0.1200)	(0.6140)	(0.2230)	(0.9548)	(0.8388)	0.6100	0.2010	(0.0209)	(0.0944)	(0.0336)	(0.1847)
High School Graduates	0.0197	0.0235	(0.0128)	(0.0121)	(0.0221)	(0.0213)	0.6440	0.1550	(0.6470)	(0.1590)	(0.6820)	(0.9350)	0.6930	0.1560	(0.0052)	0.0310	0.0122	(0.0081)
College Graduates	0.0360	0.0454	0.0257	0.0134	0.0162	0.0001	2.7930	1.1850	0.1960	0.0300	(2.0200)	(3.0220)	(0.2240)	(0.0270)	0.0808	0.0773	0.0344	(0.0957)
Graduate Degrees	0.0472	0.0567	0.0279	0.0201	0.0170	0.0105	3.8760	1.3100	0.3180	0.0160	(2.5170)	(2.7540)	(0.3350)	(0.0120)	0.0151	0.0415	0.0119	0.0727
Skill Premium	widen		widen		narrow		widen		widen		widen		narrow		widen		widen	

Figure 2.1: Wage Premium



Relative Wage of Nonproduction/Production Workers, U.S. Manufacturing. Source: NBER productivity database, (Bartelsman and Gray, 1996), *Advanced International Trade*, Robert C. Feenstra.

Figure 3.1: Regression Results



*Note: *Tariff rate, most favored nation, simple mean, all products (%)*
Source: World Development Indicators, World Bank

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